

# STRUCTURE AND PROPERTIES OF REINFORCING WIRE MEDIUM CARBON STEEL

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Reinforcing wire is a common type of reinforcement and effectively used in the products, designs and constructions of pre-stressed concrete. Prestressing reinforcement reduces the weight of structures, increases their hardness and durability. High-tensile reinforcing wire is made generally of high-carbon steels, hardened by heat treatment on the structure of sorbite, followed by cold plastic deformation. Such wire has a number of properties that provide long-term performance of structures: it has sufficient strength, a reduced tendency to brittle fracture, but it has poor weldability [1].

Reinforcing wire of low carbon steel has good weldability, but it can't provide the high strength characteristics. [2]

A compromise solution that provides improved weldability with increasing strength properties is the use of medium-reinforcing steel wire, which shows, after a special treatment on the structure of bainite followed by cold plastic deformation, strength close to the strength of high carbon steel wire.

In this regard, the task of this work is to evaluate the possibility of obtaining abainitic structure, in a piece of wire, from the medium carbon steel for reinforcing wire, by processing it in an environment which excludes molten salts.

Steel with bainitic structure hardened more quickly after plastic deformation than steel with sorbitol structure. With the processing for obtaining a bainitic structure manufactured wire with a diameter of 5-6 mm and tensile strength 2000-2250 N/mm<sup>2</sup> [3]. Typically, such heat treatment consists of heating above the  $A_{C3}$  and subsequent decomposition of austenite in molten salts at temperatures of 325- 450°C. Using metal balls instead of salt melts in this method, can increase the compressive stresses in the surface layer of the workpiece by means of a fraction micro deformed metal, reduce the risk of accidents and eliminate the harmful effects of salt vapor during operation[4 ] .

Kinetics of cooling of fractionated wire were studied with the help of an experimental model. As the model, served a soldered chromel and alumel wires with a diameter of 3 mm and 5 mm in place of junction. As cooling environment, used in the experiments was the fraction of low-carbon steel 08Г2С with the diameter 1.2 and 1.6 mm, an iron fraction 5 mm diameter, copper shot diameter 1.3 and 2.2 mm and a tube's fraction of a eutectoid steel 2.6 mm

In the experiments with lead shot used the furnace SNOL - 1,6.2,5.1 / 11. Model thermocouple was placed in a furnace and heated to 900°C, then quickly moved into a crucible filled with lead shot. Every 4sec with fixed cooling temperature. Measurements were made up until the thermocouple is not cooled to a temperature of 100°C .

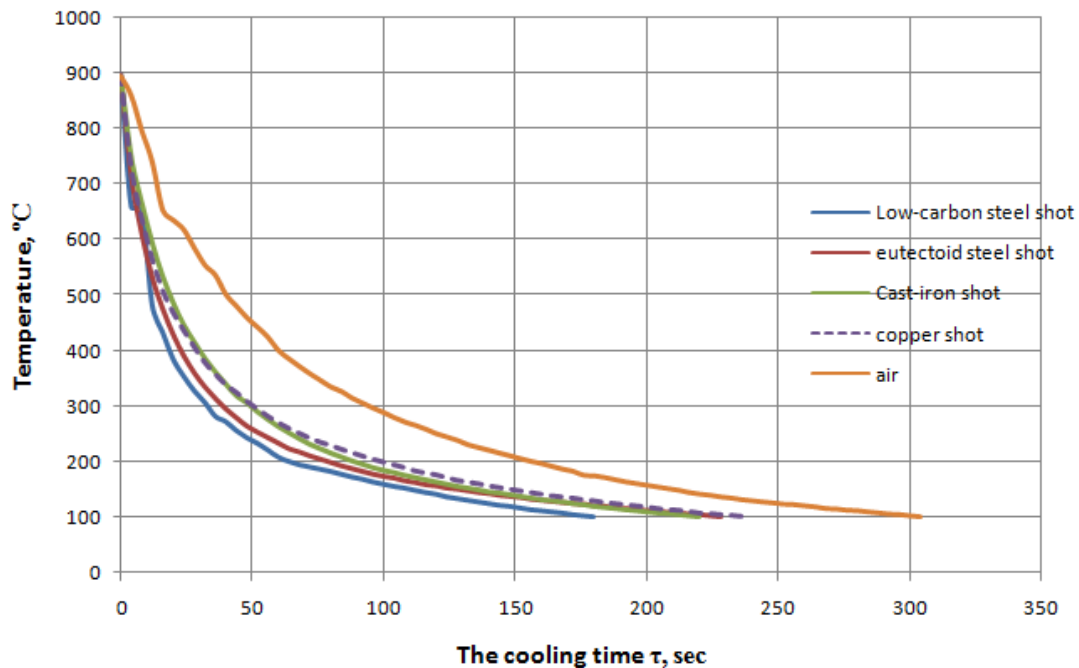


Fig.1 - The cooling curves model reference junction diameter of 5 mm from the 900°C in different environments

From the data obtained (Fig. 1) can be seen that with increasing carbon content of the cooling capacity of the fraction decreases. The highest cooling capacity in the fraction of low-carbon steel, the lowest - in cast iron. The cooling capacity of the copper fraction is also less than the fraction of low-carbon steel. This may be due to the presence of impurities in the copper. Cooling occurs in the fractions intense than in air.

Table 1 shows the average cooling rate and the test environments in 3 temperature ranges.

Table 1 - Mean cooling rate ( $^{\circ}\text{C} / \text{sec}$ ) in the temperature range depending on the material fractions

Material fractions	The temperaturerange, $^{\circ}\text{C}$		
	900 - 500	500 – 300	300 - 100
Lowcarbonsteel	39,28	8,75	1,27
Highcarbonsteel	23,78	9,00	1,15
Cast Steel	17,26	6,43	1,22
Copper	19,42	6,20	1,01
Calm air	9,22	3,83	2,44

When applying the cooling curves obtained in fractions on thermokinetic diagram decomposition of austenite [5] shows that is possible to obtain a bainitic structure, and it provides a basis to ensure properties reinforcing wire with this structure after cold drawing.

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